Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: ClPC2007

4th Semester Regular Examination: 2024-25
SUBJECT: Water Supply & Sanitary Engineering
BRANCH(S): CIVIL, CE
Time: 3 Hours
Max Marks: 100
Q.Code: S610

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Discuss the working principle of ion exchange process.
b) What are the advantage and disadvantage of dry intake tower over wet intake tower?
c) Describe methods for removal of iron and manganese from water.
d) Differentiate between coagulation and flocculation.
e) Discuss the factors, which affect the per capita demand of water in a community?
f) What are the functions of primary clarifier in waste water treatment plant?
g) The 5 day at 20◦C BOD test result of a 100 times diluted waste water sample is as follows: Initial dissolved oxygen: 7.1 mg/L, Final dissolved oxygen: 2.3 mg/L. Find BOD_5?
h) Explain the bacterial growth curve with a neat sketch.
i) What are three R's of solid waste management?
j) Discuss the factors influencing solid waste generation rates.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Discuss two Physical, three chemical, and one biological water quality parameters and their significance
b) What is an intake? List the factors that govern the selection of a site for intake structure.
c) A pump is to deliver water from an underground tank against a static head of 62 m. The suction pipe is 85 m long and is of 40 cm diameter with Darcy-Weisbach friction factor f = 0.02. The delivery pipe is of 40 cm diameter, 2100 m long and f = 0.022. The pump characteristics may be expressed as $H_p = 100 - 6000Q^2$. Where H_p = pump head in meters and Q = discharge in m^3/sec. Calculate the head and discharge of the pump.
d) What are the different methods of water softening? Describe Lime soda process of water softening in detail.
e) Discuss the different stages in sludge digestion process and factors affecting the process.

f) Differentiate between slow sand filter and rapid sand filter with reference to following parameters (a) rate of filtration (b) efficiency (c) size (d) method of cleaning (e) period of cleaning (f) effective size [d10] of sand

g) Design six slow sand filter beds from the following data:
- Population to be served = 50000 persons
- Quantity of water to be supplied = 200 litres per head per day
- Length of each bed is twice the breadth
- Rate of filtration: 150 litres/hr/m^2

Assume whatever data are necessary and not given.

h) A trickling filter has a diameter of 30 m and depth 3 m. It is operated with a direct circulation ratio of 1.5 and influent sewage rate of 2 million litres per day. Influent BOD into the filter is 200 mg/L and effluent BOD is 30 mg/L. Calculate the hydraulic loading rate and organic loading rate. What is the efficiency of the filter?

i) Discuss the working principles of following waste water treatment unit/process: (i) Skimming Tank (ii) Grit Chamber

j) Describe the various methods of sludge thickening.

k) Discuss on classification of Solid Waste based on (i) Source (ii) Types.

l) Explain and draw typical SWM system with its functional elements and linkages.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 Define design period and population forecasting. What are the factors affecting the design period? A town has a population detail as given under. Estimate the future population in the year 2050 using Arithmetic Increase, Geometric Increase, incremental increase method and decreasing rate of growth method. **(16)**

Year	1950	1960	1970	1980	1990	2000	2010
Population ($x10^3$)	400	540	995	1550	1713	1893	2100

Q4 Discuss the working principles of any FOUR water treatment processes: (i) Sedimentation (ii) Electro-dialysis (iii) Defloridation (iv) Aeration (v) Disinfection **(16)**

Q5 What is meant by activated sludge process and trickling filter? Describe with neat sketch. Mention the advantage and disadvantage of these systems. **(16)**

Q6 Explain briefly the working principle, advantages, and disadvantages of biological treatment (aerobic and anaerobic composting) and thermal treatment (incineration) of municipal solid waste. **(16)**